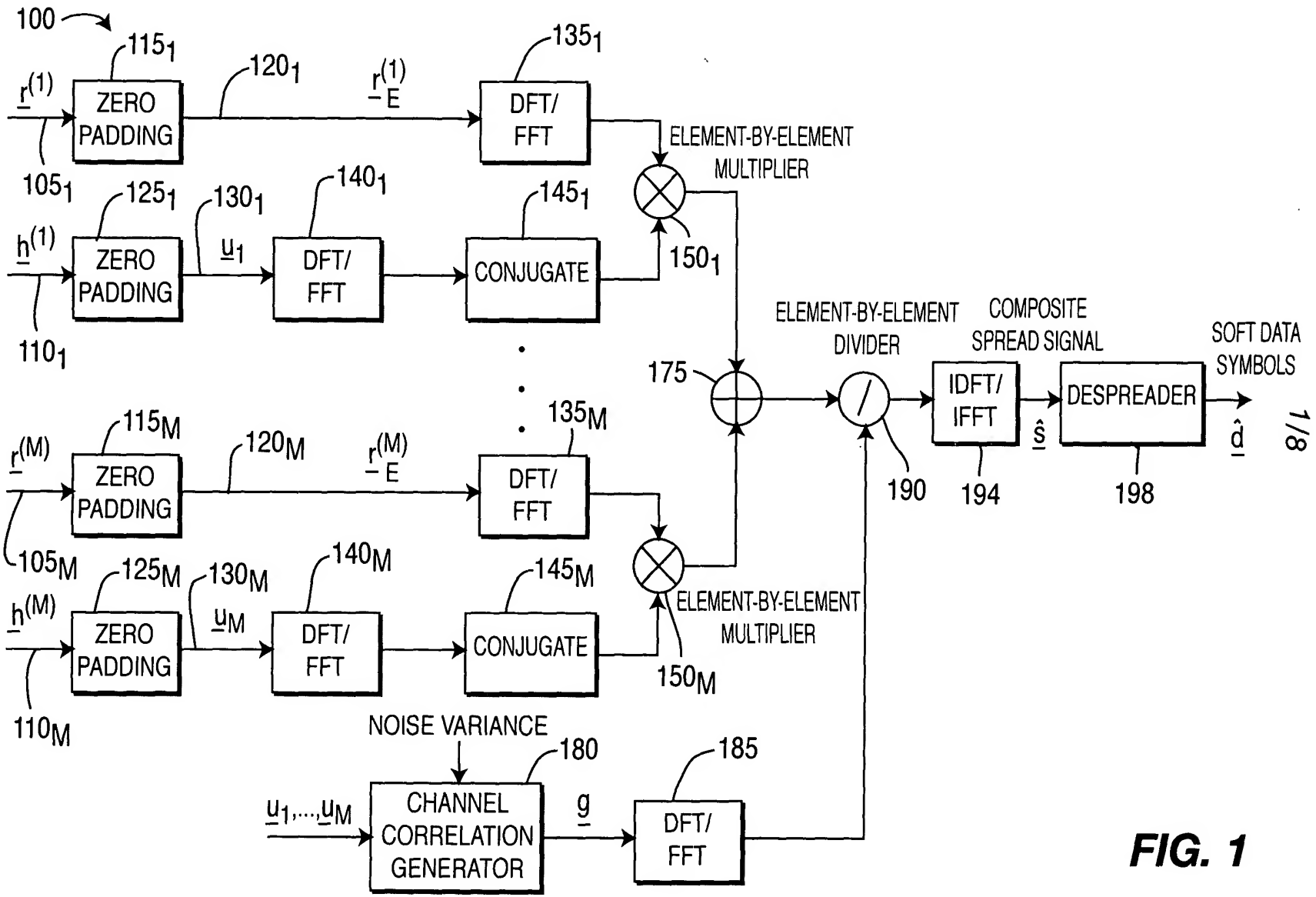
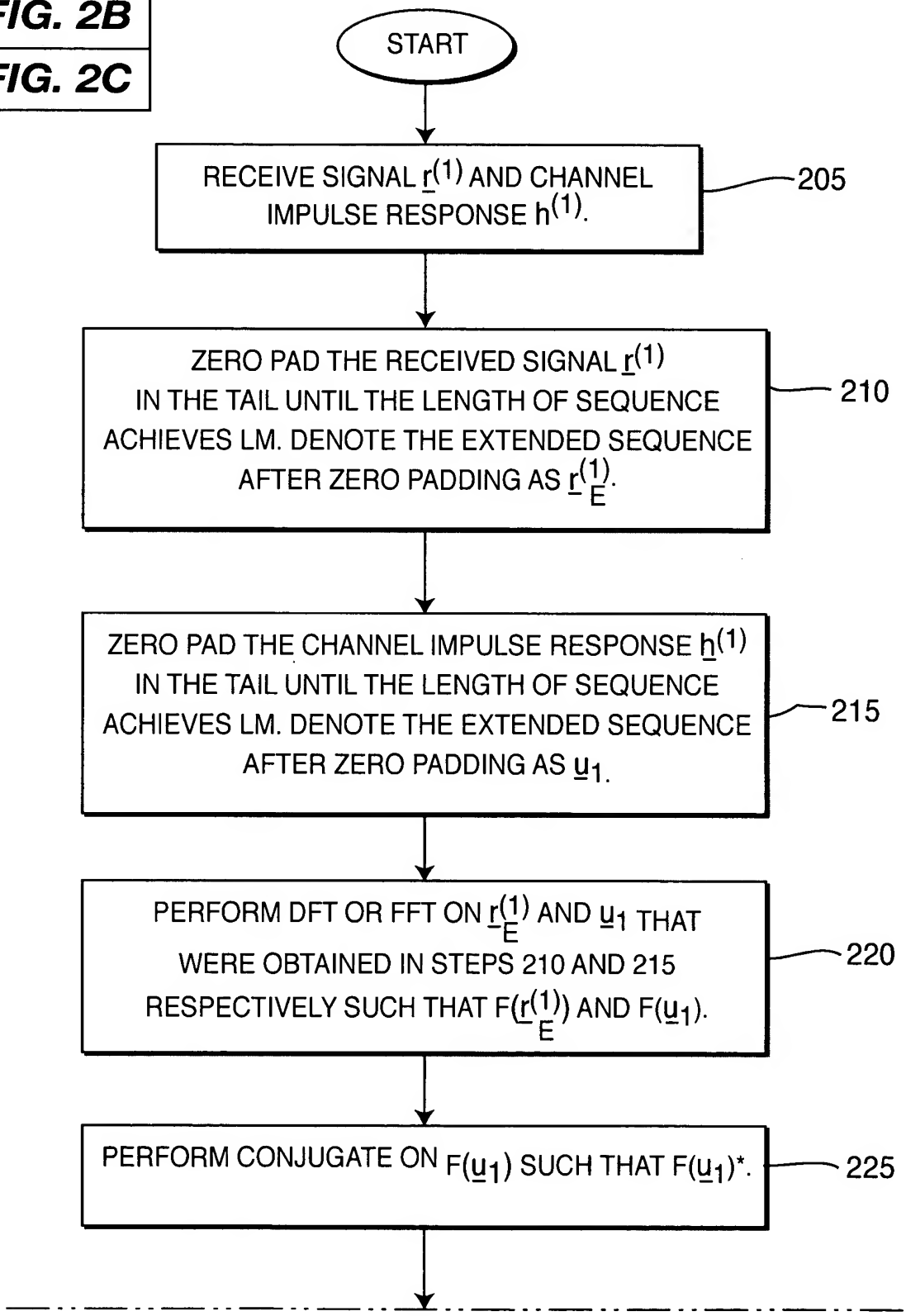

100
115_1
$\underline{r}^{(1)}$
ZERO PADDING
105_1
120_1
$\underline{r}^{(1)}_E$
135_1
DFT/ FFT
ELEMENT-BY-ELEMENT MULTIPLIER
125_1
130_1
140_1
145_1
$\underline{h}^{(1)}$
ZERO PADDING
110_1
$\underline{u}_1$
DFT/ FFT
CONJUGATE
150_1
175
ELEMENT-BY-ELEMENT DIVIDER
COMPOSITE SPREAD SIGNAL
SOFT DATA SYMBOLS
IDFT/ IFFT
DESPREADER
$\underline{\hat{s}}$
$\underline{\hat{d}}$
190
194
198
115_M
$\underline{r}^{(M)}$
ZERO PADDING
105_M
120_M
$\underline{r}^{(M)}_E$
135_M
DFT/ FFT
125_M
130_M
140_M
145_M
$\underline{h}^{(M)}$
ZERO PADDING
110_M
$\underline{u}_M$
DFT/ FFT
CONJUGATE
150_M
ELEMENT-BY-ELEMENT MULTIPLIER
NOISE VARIANCE
180
185
$\underline{u}_1,\ldots,\underline{u}_M$
CHANNEL CORRELATION GENERATOR
$\underline{g}$
DFT/ FFT

FIG. 1

FIG. 2

FIG. 2A
FIG. 2B
FIG. 2C

FIG. 2A



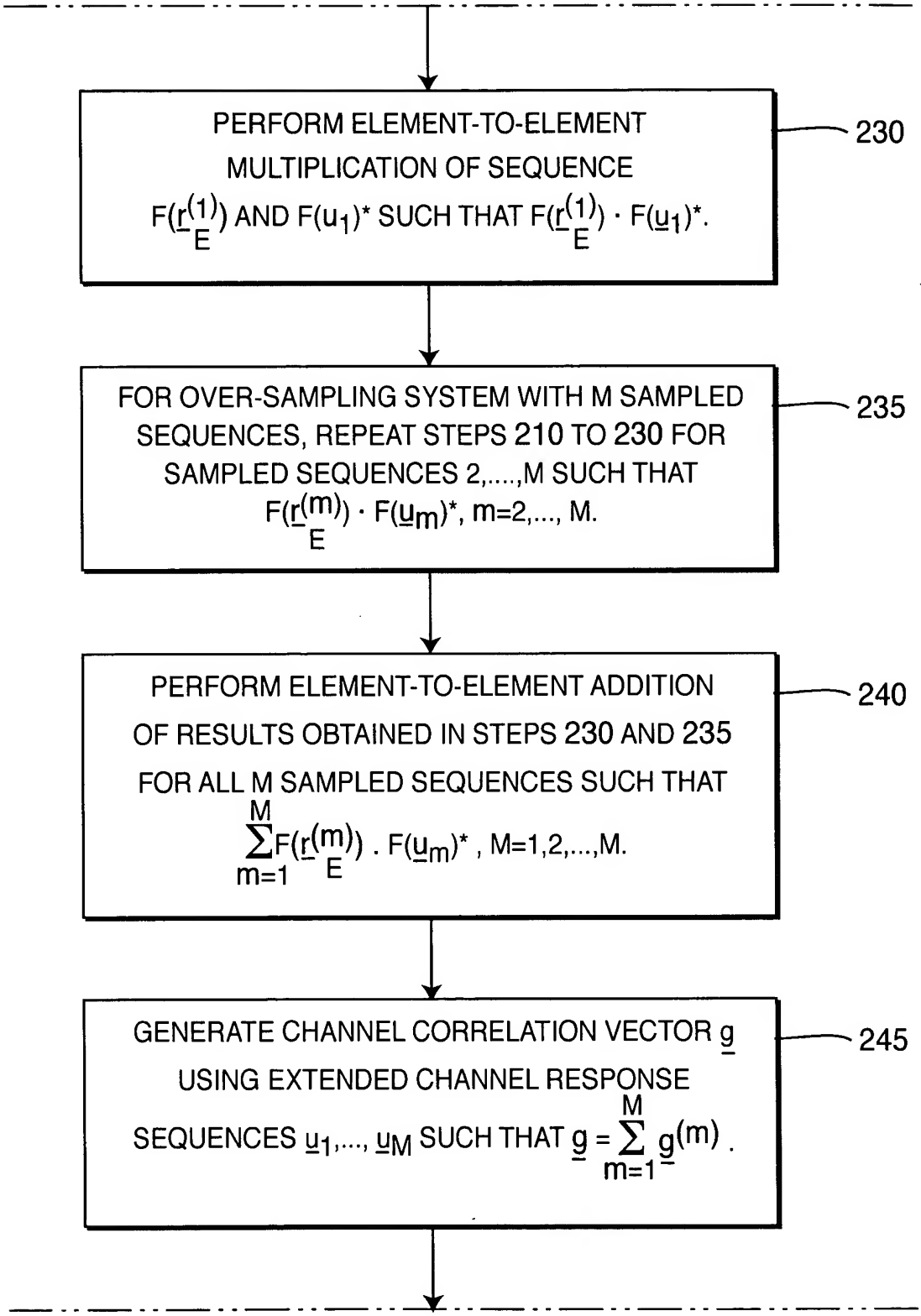

PERFORM ELEMENT-TO-ELEMENT MULTIPLICATION OF SEQUENCE $F(\underline{r}_E^{(1)})$ AND $F(u_1)^*$ SUCH THAT $F(\underline{r}_E^{(1)}) \cdot F(\underline{u}_1)^*$.
230
FOR OVER-SAMPLING SYSTEM WITH M SAMPLED SEQUENCES, REPEAT STEPS 210 TO 230 FOR SAMPLED SEQUENCES 2,....,M SUCH THAT $F(\underline{r}_E^{(m)}) \cdot F(\underline{u}_m)^*$, m=2,..., M.
235
PERFORM ELEMENT-TO-ELEMENT ADDITION OF RESULTS OBTAINED IN STEPS 230 AND 235 FOR ALL M SAMPLED SEQUENCES SUCH THAT $\sum_{m=1}^{M} F(\underline{r}_E^{(m)}) \cdot F(\underline{u}_m)^*$, M=1,2,...,M.
240
GENERATE CHANNEL CORRELATION VECTOR $\underline{g}$ USING EXTENDED CHANNEL RESPONSE SEQUENCES $\underline{u}_1,..., \underline{u}_M$ SUCH THAT $\underline{g} = \sum_{m=1}^{M} \underline{g}^{(m)}$.
245

FIG. 2B

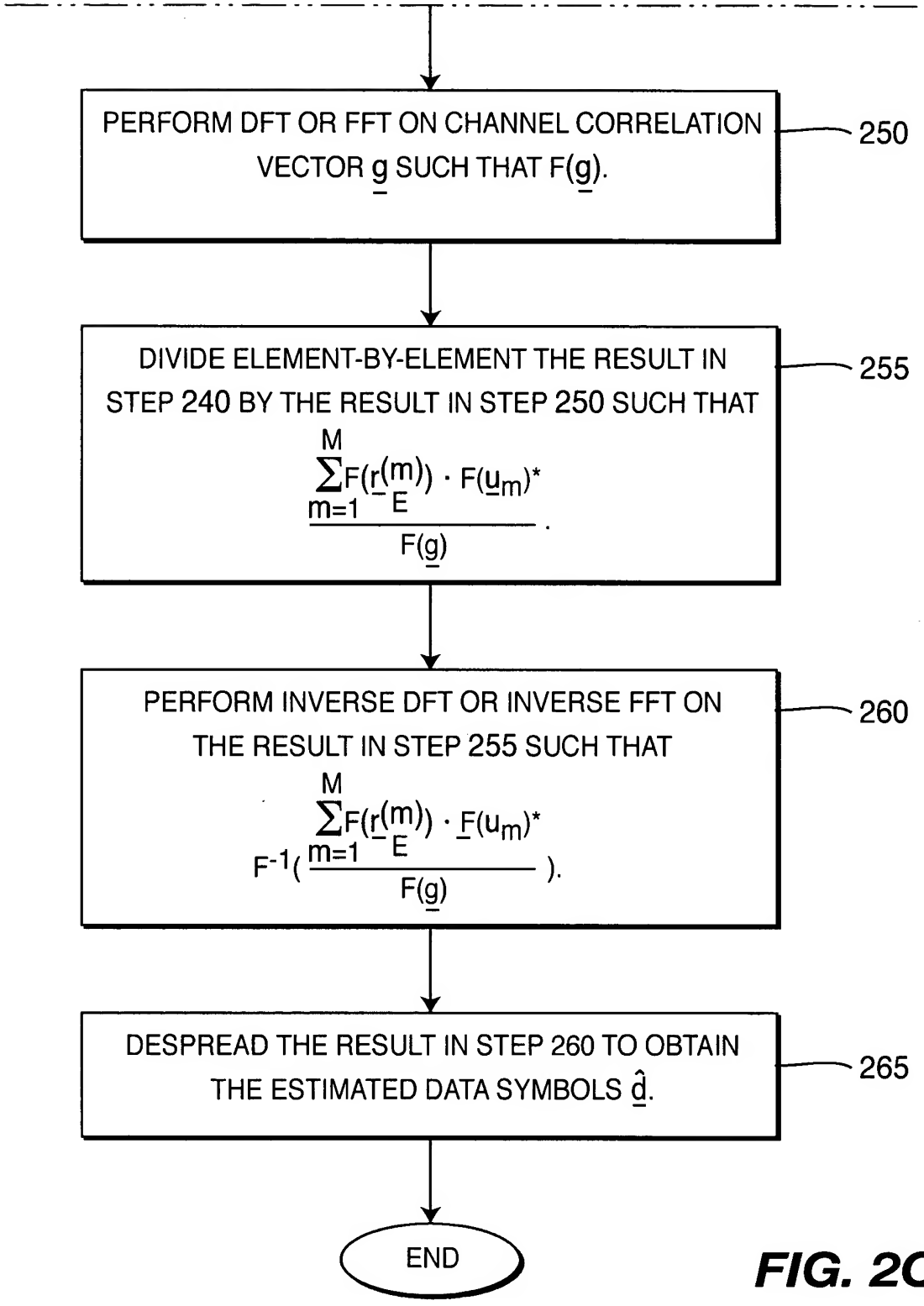

PERFORM DFT OR FFT ON CHANNEL CORRELATION VECTOR g SUCH THAT F(g).
250
DIVIDE ELEMENT-BY-ELEMENT THE RESULT IN STEP 240 BY THE RESULT IN STEP 250 SUCH THAT $\frac{\sum_{m=1}^{M} F(\underline{r}_E(m)) \cdot F(\underline{u}_m)^*}{F(\underline{g})}$.
255
PERFORM INVERSE DFT OR INVERSE FFT ON THE RESULT IN STEP 255 SUCH THAT $F^{-1}\left(\frac{\sum_{m=1}^{M} F(\underline{r}_E(m)) \cdot \underline{F}(u_m)^*}{F(\underline{g})}\right)$.
260
DESPREAD THE RESULT IN STEP 260 TO OBTAIN THE ESTIMATED DATA SYMBOLS $\hat{d}$.
265
END

FIG. 2C

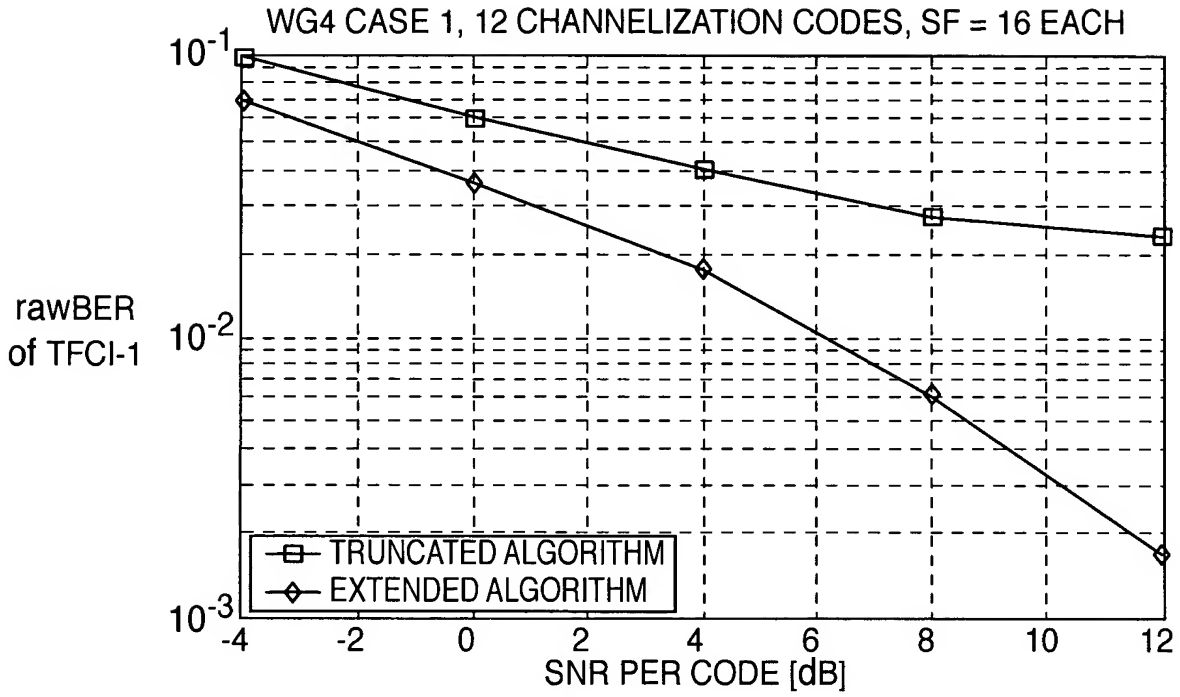

WG4 CASE 1, 12 CHANNELIZATION CODES, SF = 16 EACH
rawBER of TFCI-1
10^{-1}
10^{-2}
10^{-3}
TRUNCATED ALGORITHM
EXTENDED ALGORITHM
-4
-2
0
2
4
6
8
10
12
SNR PER CODE [dB]

FIG. 3

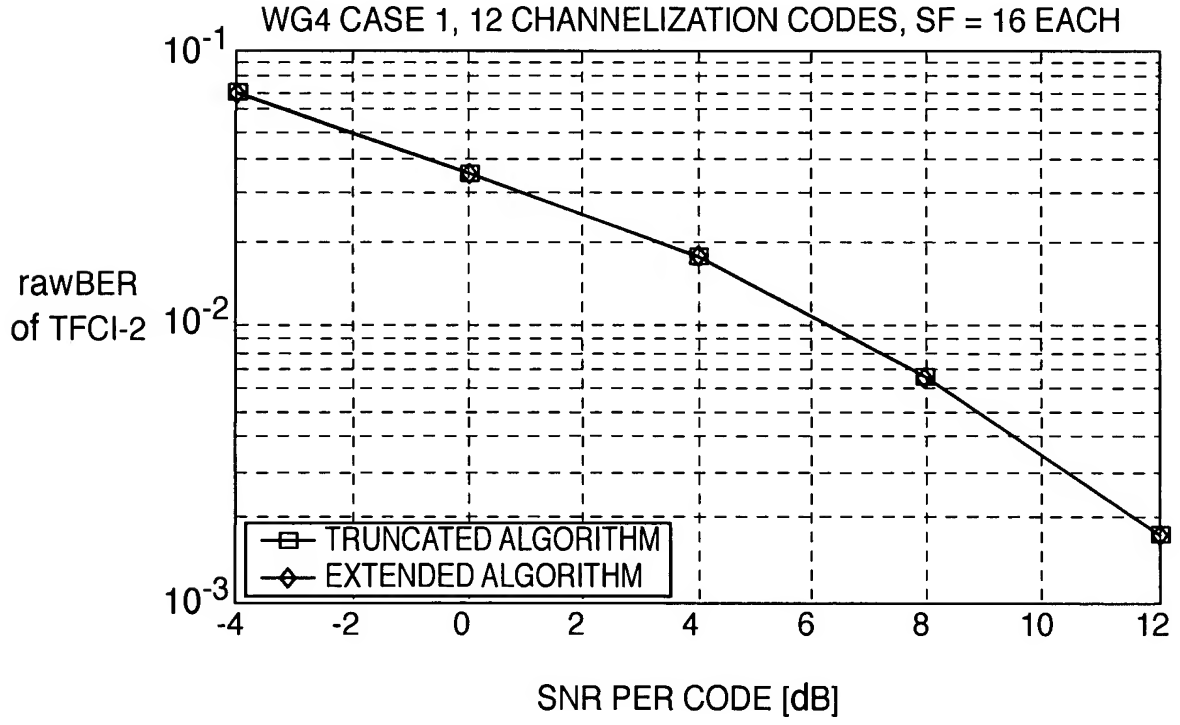

WG4 CASE 1, 12 CHANNELIZATION CODES, SF = 16 EACH
rawBER of TFCI-2
10^{-1}
10^{-2}
10^{-3}
TRUNCATED ALGORITHM
EXTENDED ALGORITHM
-4
-2
0
2
4
6
8
10
12
SNR PER CODE [dB]

FIG. 4

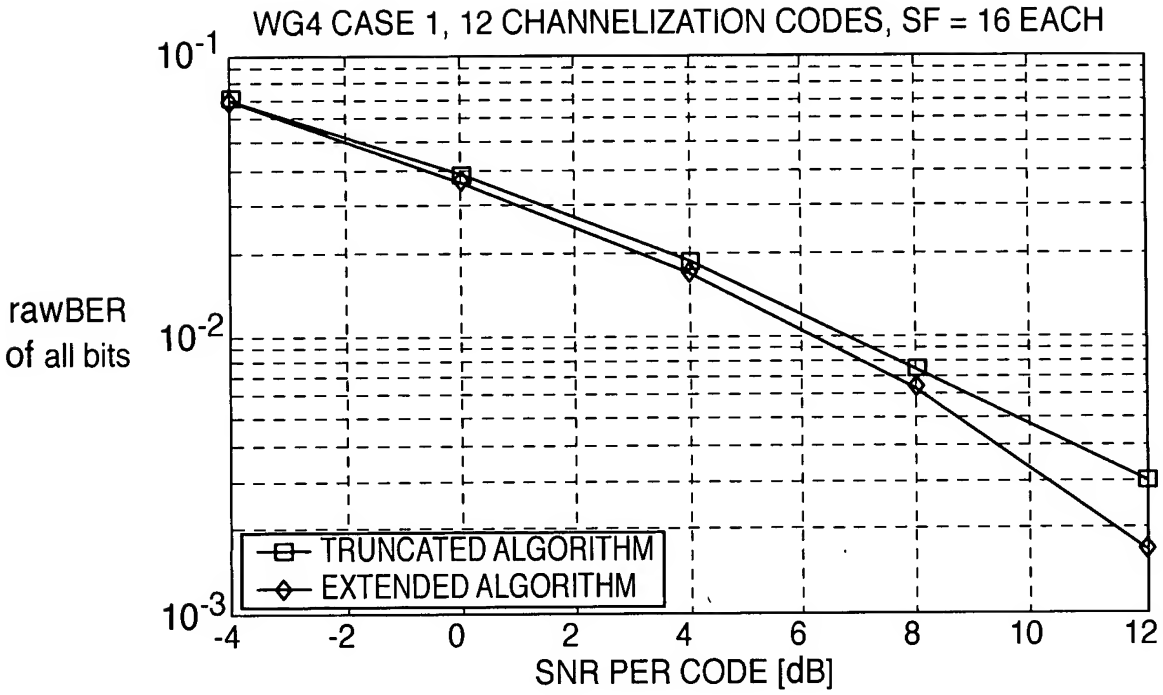

WG4 CASE 1, 12 CHANNELIZATION CODES, SF = 16 EACH
rawBER
of all bits
10^{-1}
10^{-2}
10^{-3}
TRUNCATED ALGORITHM
EXTENDED ALGORITHM
-4
-2
0
2
4
6
8
10
12
SNR PER CODE [dB]

FIG. 5

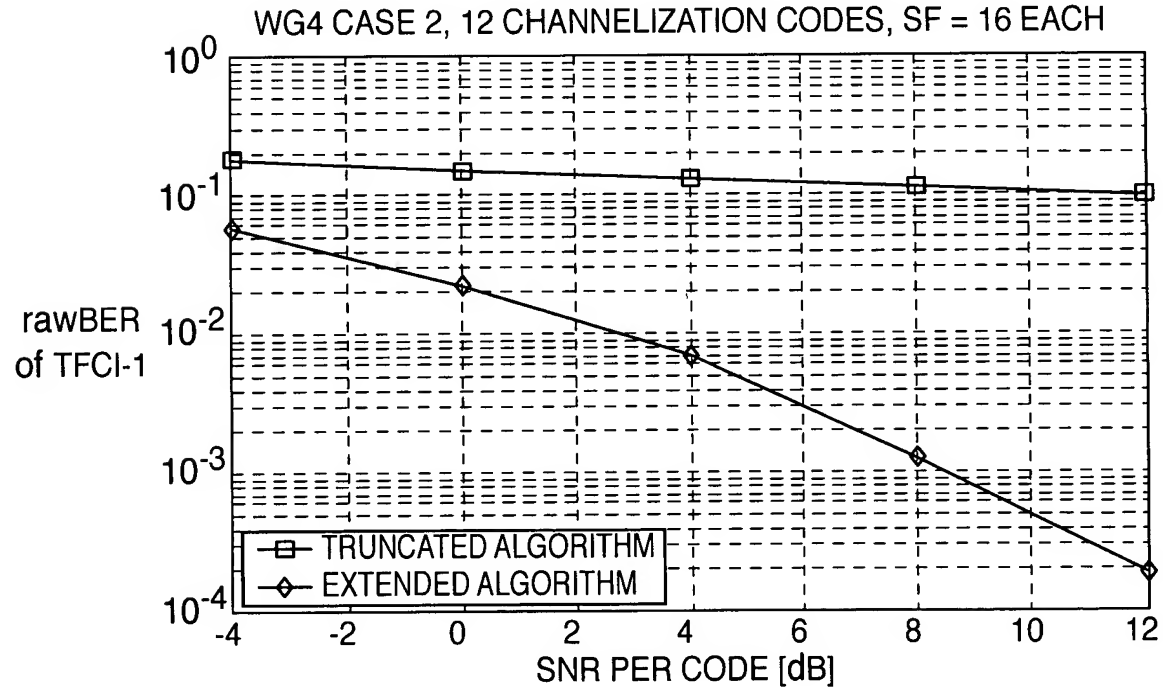

WG4 CASE 2, 12 CHANNELIZATION CODES, SF = 16 EACH
rawBER
of TFCI-1
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
TRUNCATED ALGORITHM
EXTENDED ALGORITHM
-4
-2
0
2
4
6
8
10
12
SNR PER CODE [dB]

FIG. 6

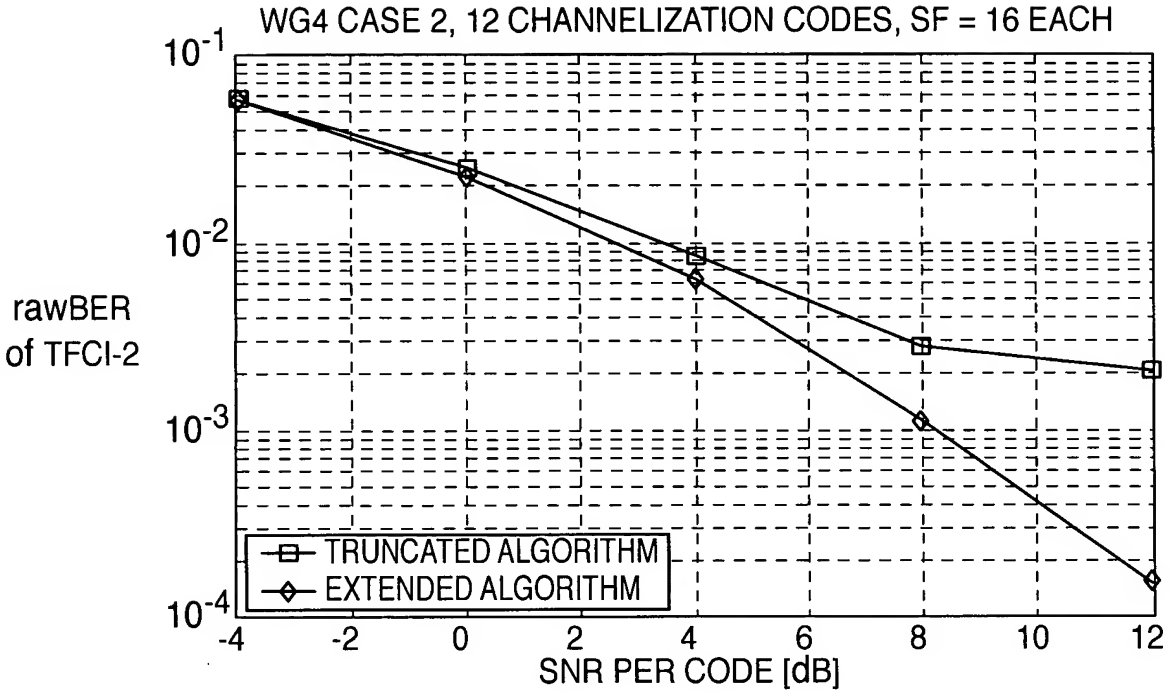

WG4 CASE 2, 12 CHANNELIZATION CODES, SF = 16 EACH
rawBER
of TFCI-2
10^{-1}
10^{-2}
10^{-3}
10^{-4}
TRUNCATED ALGORITHM
EXTENDED ALGORITHM
-4
-2
0
2
4
6
8
10
12
SNR PER CODE [dB]

FIG. 7

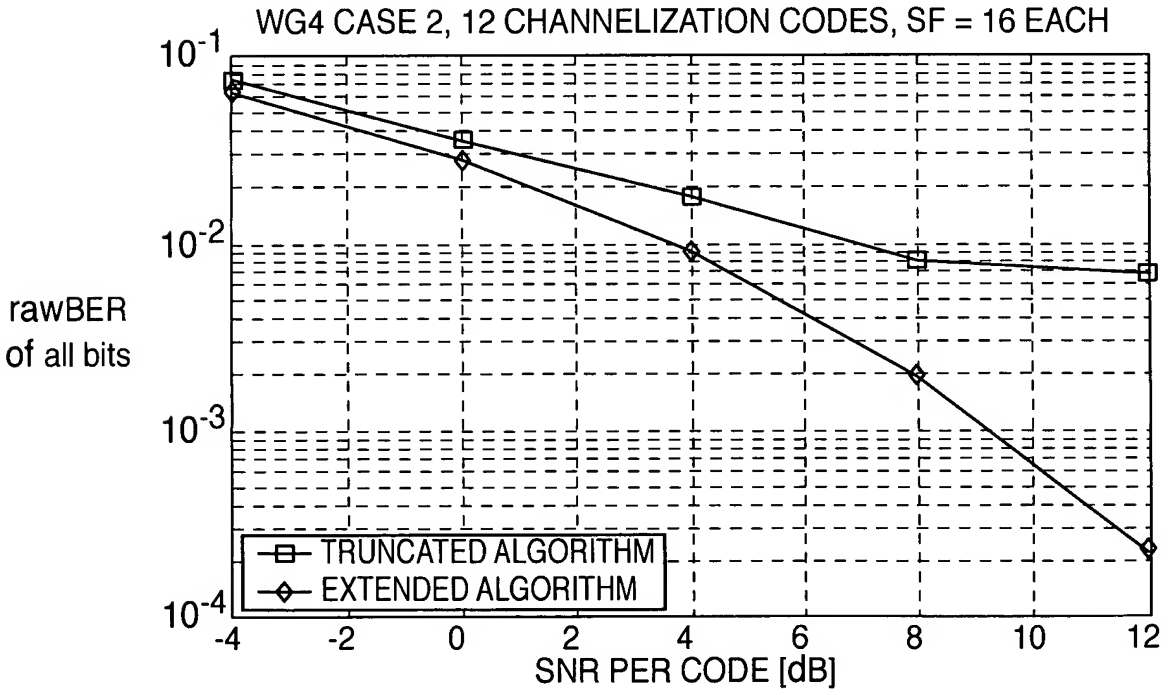

WG4 CASE 2, 12 CHANNELIZATION CODES, SF = 16 EACH
rawBER
of all bits
10^{-1}
10^{-2}
10^{-3}
10^{-4}
TRUNCATED ALGORITHM
EXTENDED ALGORITHM
-4
-2
0
2
4
6
8
10
12
SNR PER CODE [dB]

FIG. 8

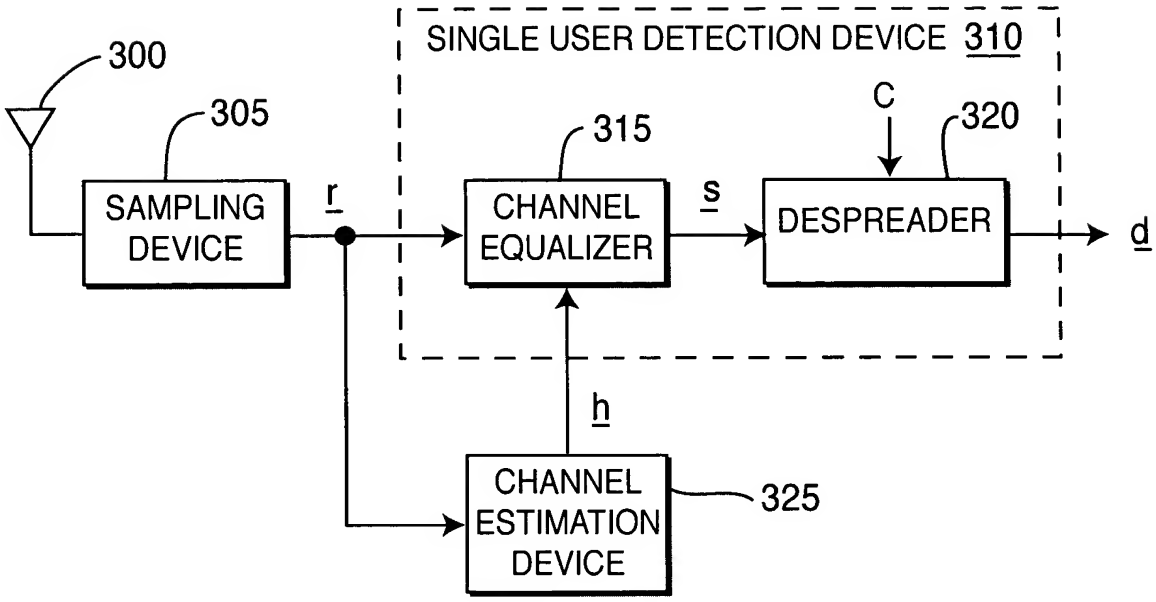

SINGLE USER DETECTION DEVICE 310
300
305
SAMPLING DEVICE
r
315
CHANNEL EQUALIZER
s
C
320
DESPREADER
d
h
CHANNEL ESTIMATION DEVICE
325

FIG. 9A

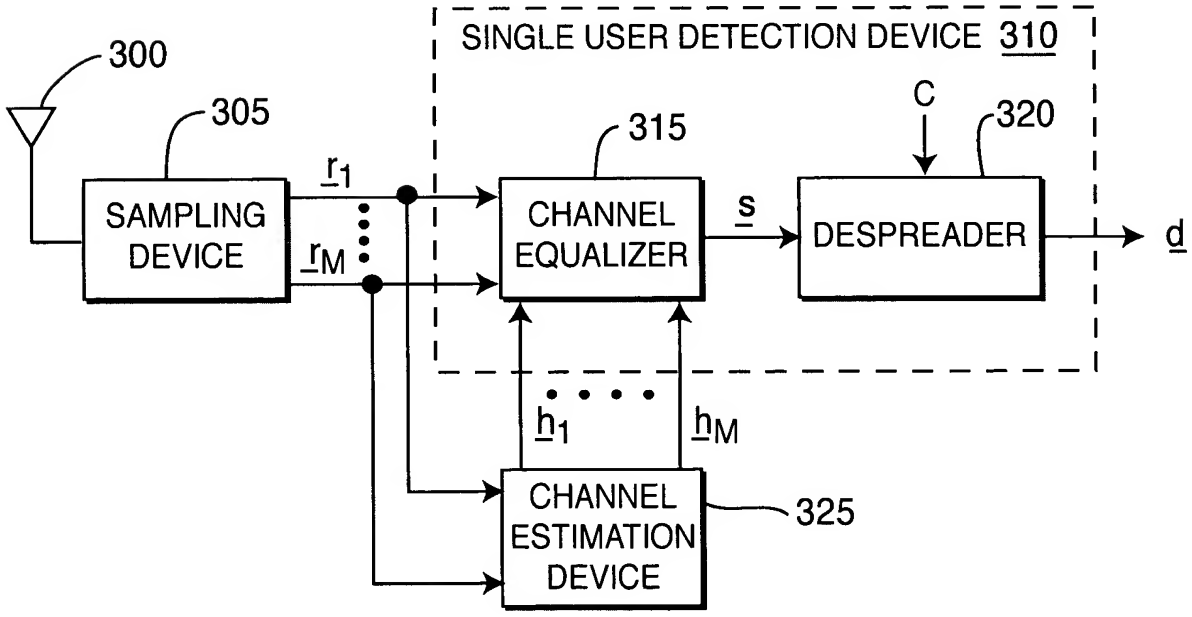

SINGLE USER DETECTION DEVICE 310
300
305
SAMPLING DEVICE
r1
rM
315
CHANNEL EQUALIZER
s
C
320
DESPREADER
d
h1
hM
CHANNEL ESTIMATION DEVICE
325

FIG. 9B